TY-RAP® CABLE TIES

PEP ecopassport®

Product Environmental Profile

Product Environmental Profile - PEP Ecopassport.
Document in compliance with ISO 14025: 2006 "Environmental labels and declarations. Type III environmental declarations"

ORGANIZATION		CONTACT INFORMATION			
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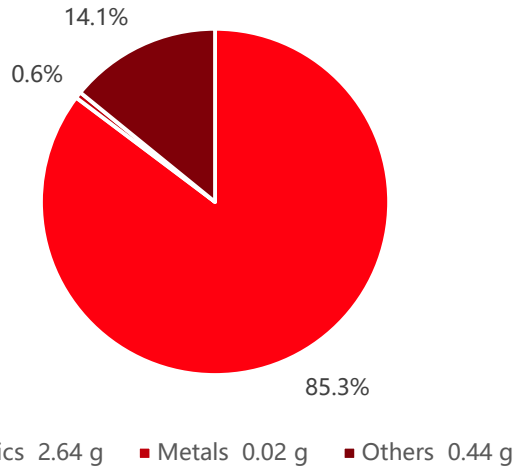
ABB Purpose & Embedding Sustainability

ABB is committed to continually promoting and embedding sustainability across its operations and value chain, aspiring to become a role model for others to follow. With its ABB Purpose, ABB is focusing on reducing harmful emissions, preserving natural resources and championing ethical and humane behavior.

General Information

Reference product	Product TY28MX
Description of the product	Ty-Raps® are cable ties characterized by a corrosion-resistant, non-magnetic stainless-steel locking barb in its head grips tightly and allows for a completely adjustable fit. Moreover, its raised tail makes it easy to pick up, even with gloved hand, and its easy-grip tail surface makes it easy to pull tight, even in wet or cold conditions.
Functional unit	The functional unit is to mount a cable or a tube at a point with a cable tie with a clamping capacity between 1.5 mm and 229 mm for a reference lifetime of 20 years. The reference product is one piece of TY28MX cable tie with a weight of 2.633 g and its packaging of 0.4325 g.
Other products covered	List of other products covered in this PEP is presented in the paragraph which concerned the extrapolation rules

Constituent Materials



Total weight of Reference product included packaging	3.1	g

Plastics as % of weight		Metals as % of weight		Others as % of weight	
Name and CAS number	Weight%	Name and CAS number	Weight%	Name and CAS number	Weight%
Nylon	85.3	Steel	0.6	Low density polyethylene	1.2
-	-	-	-	Label	0.0
-	-	-	-	Cardboard	3.8
-	-	-	-	Wood	9.1

Total weight of the reference product 2.633 g plus packaging 0.4325 g

Additional Environmental Information

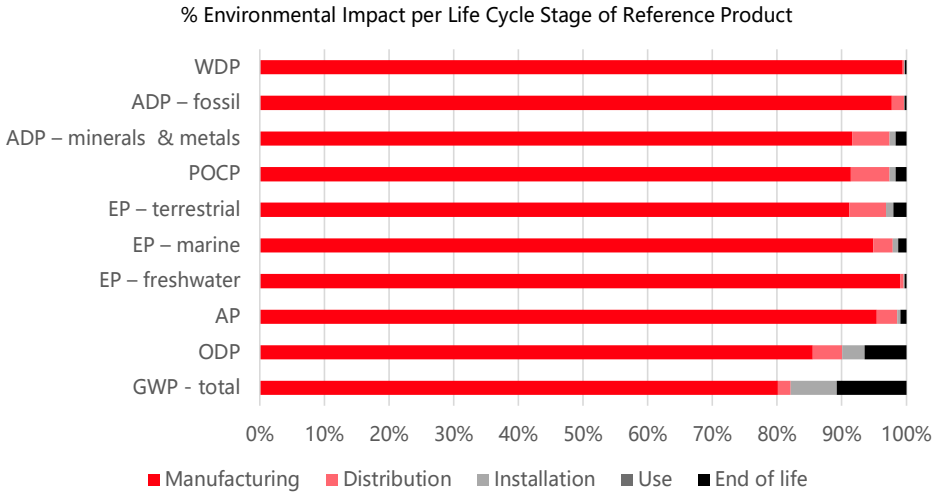
Manufacturing	The manufacturing stage includes the production and transportation to the manufacturer's last logistic platform of Ty-Rap® cable ties and its packaging. The final assembly of the product is carried out at ABB's plant located in Kecskemét, Kadafalva-Heliport, (HU)
Distribution	The transport from ABB HU factory to storage (Belgium) site was taken into account. For the distribution of the product from storage to the final customer, secondary data for the distance has been used for lorry and a weighted average has been computed relative to distances with a cut-off about 10%.
Installation	No installation materials are required in the life cycle of the product. During this phase there is the disposal of the excess cable tie cut and the packaging.
Use	No material and energy consumption occur during the use stage. No maintenance happens during the use phase, the environmental impacts linked to this procedure have been considered equal to zero in the respective results section.
End of life	The default end-of-life scenario provided by the PCR document has been adopted for the the Ty-Rap® cable ties (100% incineration).
Benefits and loads beyond the system boundaries	No benefits and loads beyond the system boundaries has been considered.

Environmental Impacts

Reference lifetime	20 years
Product category	PCR-ed4-EN-2021 09 06 PSR-0003-ed2-EN-2023 06 06
Installation elements	No installation materials are required in the life cycle of the product. During this phase there is the disposal of the excess cable tie cut
Use scenario	No material and energy consumption occur during the use stage. No maintenance phase is planned for the the Ty-Rap® cable ties.
Geographical and temporal representativeness	The geographical representativeness is global. All primary data collected from ABB are from 2022, which is a representative production year. Secondary data refers to the ecoinvent database v3.9.1 published in 2022. The temporal coverage for each secondary process used in the LCA model is specified in the metadata section of the ecoivent database
Technological representativeness	Technological representativeness refers to the specific production process for primary data.
Software and database used	SimaPro 9.5 and ecoinvent 3.9.1

Energy model used	
Manufacturing	The energy-related processes used for the inputs of the manufacturing stage are those included in the ecoinvent 3.9.1 datasets selected for the analysis.
Installation	No energy consumption occur during the installation stage.
Use	No energy consumption occur during the use stage.
End of life	The energy-related processes used for the inputs of the end-of-life stage are those included in ecoinvent 3.9.1

Common base of mandatory indicators



Environmental impact indicators

Indicator	Unit	Total	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
GWP-total	kg CO_2 eq.	3.76E-02	3.01E-02	7.39E-04	2.70E-03	0.00E+00	4.04E-03	0.00E+00
GWP-fossil	kg CO_2 eq.	3.74E-02	3.04E-02	7.38E-04	2.22E-03	0.00E+00	4.04E-03	0.00E+00
GWP-biogenic	kg CO_2 eq.	1.83E-04	-2.93E-04	5.25E-07	4.75E-04	0.00E+00	5.47E-07	0.00E+00
GWP-luluc	kg CO_2 eq.	1.33E-05	1.27E-05	3.64E-07	5.35E-08	0.00E+00	1.01E-07	0.00E+00
GWP-fossil = Global Warming Potential fossil fuels GWP-biogenic = Global Warming Potential biogenic GWP-luluc = Global Warming Potential land use and land use change								
ODP	kg CFC-11 eq.	3.51E-10	3.00E-10	1.59E-11	1.21E-11	0.00E+00	2.27E-11	0.00E+00
ODP = Depletion potential of the stratospheric ozone layer								
AP	H+ eq.	1.34E-04	1.27E-04	4.27E-06	6.67E-07	0.00E+00	1.20E-06	0.00E+00
AP = Acidification potential, Accumulated Exceedance								
EP-freshwater	kg P eq.	9.76E-06	9.66E-06	5.11E-08	1.50E-08	0.00E+00	2.52E-08	0.00E+00
EP-marine	kg N eq.	4.72E-05	4.48E-05	1.44E-06	3.89E-07	0.00E+00	5.96E-07	0.00E+00
EP-terrestrial	mol N eq.	2.71E-04	2.47E-04	1.55E-05	3.04E-06	0.00E+00	5.45E-06	0.00E+00
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment EP-terrestrial = Eutrophication potential, Accumulated Exceedance								
POCP	kg NMVOC eq.	8.97E-05	8.20E-05	5.40E-06	8.35E-07	0.00E+00	1.50E-06	0.00E+00
POCP = Formation potential of tropospheric ozone								
ADP-minerals & metals	kg Sb eq.	3.30E-08	3.02E-08	1.92E-09	2.90E-10	0.00E+00	5.53E-10	0.00E+00
ADP-fossil	MJ	5.70E-01	5.57E-01	1.07E-02	7.08E-04	0.00E+00	1.47E-03	0.00E+00
ADP-minerals & metals = Abiotic depletion potential for non-fossil resources ADP-fossil = Abiotic depletion for fossil resources potential								
WDP	m^3 eq. depr.	2.49E-02	2.48E-02	4.98E-05	3.21E-05	0.00E+00	5.85E-05	0.00E+00
WDP = Water Deprivation potential								

Common base of mandatory indicators

Inventory flows indicator – Resource use indicators

Indicator	Unit	Total	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
PERE	MJ	2.78E-02	2.75E-02	1.53E-04	4.95E-05	0.00E+00	8.12E-05	0.00E+00
PERM	MJ	7.72E-03	7.72E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	3.55E-02	3.52E-02	1.53E-04	4.95E-05	0.00E+00	8.12E-05	0.00E+00
PENRE	MJ	4.69E-01	4.56E-01	1.07E-02	7.08E-04	0.00E+00	1.47E-03	0.00E+00
PENRM	MJ	1.01E-01	1.01E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	5.70E-01	5.57E-01	1.07E-02	7.08E-04	0.00E+00	1.47E-03	0.00E+00

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM = Use of renewable primary energy resources used as raw materials
PERT = Total Use of renewable primary energy resources
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM = Use of non-renewable primary energy resources used as raw materials
PENRT = Total Use of non-renewable primary energy resources

Inventory flows indicator – Indicators describing the use of secondary materials, water, and energy resources

Indicator	Unit	Total	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
SM	kg	9.16E-04	9.16E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	6.48E-04	6.43E-04	1.64E-06	1.35E-06	0.00E+00	2.32E-06	0.00E+00

SM = Use of secondary material
RSF = Use of renewable secondary fuels
NRSF = Use of non-renewable secondary fuels
FW = Use of net fresh water

Inventory flows indicator – Waste category indicators

Indicator	Unit	Total	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
Hazardous waste disposed	kg	6.69E-07	5.90E-07	6.60E-08	3.92E-09	0.00E+00	8.75E-09	0.00E+00
Non- hazardous waste disposed	kg	4.08E-03	2.97E-03	8.94E-04	1.47E-04	0.00E+00	7.30E-05	0.00E+00
Radioactive waste disposed	kg	1.55E-06	1.54E-06	3.17E-09	1.03E-09	0.00E+00	1.63E-09	0.00E+00

Common base of mandatory indicators

Inventory flows indicator – Output flow indicators

Indicator	Unit	Total	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	1.21E-03	1.03E-03	0.00E+00	1.80E-04	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ	3.25E-02	7.78E-05	0.00E+00	1.20E-02	0.00E+00	2.05E-02	0.00E+00

Inventory flow indicator – other indicators

Indicator	**Unit**	Total	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
Biogenic carbon content of the product	kg of C	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content of the associated packaging	kg of C	1.30E-04	1.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Optional indicators

Environmental indicators

Indicator	Unit	Total	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
Total use of primary energy during the life cycle	MJ	6.05E-01	5.92E-01	1.09E-02	7.57E-04	0.00E+00	1.55E-03	0.00E+00
Emissions of fine particles	incidence of diseases	1.21E-09	1.12E-09	7.28E-11	5.82E-12	0.00E+00	1.09E-11	0.00E+00
Ionizing radiation, human health	kBq U235 eq.	6.49E-03	6.47E-03	1.31E-05	4.01E-06	0.00E+00	6.33E-06	0.00E+00
Ecotoxicity (fresh water)	CTUe	8.02E-02	5.93E-02	5.18E-03	5.51E-03	0.00E+00	1.01E-02	0.00E+00
Human toxicity, car-cinogenic effects	CTUh	1.01E-11	8.61E-12	3.21E-13	4.38E-13	0.00E+00	7.50E-13	0.00E+00
Human toxicity, non-carcinogenic effects	incidence of diseases	1.23E-10	1.05E-10	7.47E-12	3.71E-12	0.00E+00	6.58E-12	0.00E+00
Impact related to land use/soil quality		1.32E-01	1.21E-01	1.04E-02	3.25E-04	0.00E+00	6.41E-04	0.00E+00

Other indicators

Indicator	Unit	Total	Manu-facturing	Distri-bution	Installation	Use	End of life	Bene-fits
No Other indicators used								

Approach for extrapolation rules applied to a homogeneous environmental family

The PEP can cover products different from the reference product if they belong to a homogeneous environmental family. This means that the group of products must satisfy the following characteristics:

- same function;
- same product standard;
- same manufacturing technology: the same type of materials and same manufacturing processes.

The Ty-Rap® cable ties product family satisfy these conditions, so extrapolation rules were applied to assess the environmental impact of the products belonging to the family, following the PCR indication. No extrapolation rules for cable management products are set in the PSR, thus the next steps have been followed to define the extrapolation rules:

- Analyse the products covered by the PEP belonging to the same homogenous family;
- Perform the LCA of a representative product of the homogeneous family;
- Identify and quantify the product parameters that vary between the various products of the homogeneous environmental family (i.e. dimensions, the weight of parts, materials, energy consumption, etc.).

Lastly, a sensitivity analysis was performed for each life cycle stage to identify which parameters of the ones selected are sensitive to environmental impacts to create extrapolation rules.

The parameters identified are listed below:

- ties weight;
- packaging weight;
- ties composition (nylon and steel);
- input of recycled nylon.

The representative product considered for the calculation of the extrapolation rules is TY28MX. This product is most representative for the sales.

The products included in the Ty-Rap® cable ties product family and considered for the application of the extrapolation rules are resented in the following table.

Variant	Weight of the cable tie (g)	Weight of the packaging (g)	Weight of the cable tie + weight of the packaging (g)
TY232M	5.01E-01	3.54E-01	8.55E-01
TY232M-1	5.05E-01	3.25E-01	8.30E-01
TY232M-3	5.05E-01	3.25E-01	8.30E-01
TY232M-5	5.05E-01	3.25E-01	8.30E-01
TY232M-7	5.05E-01	3.25E-01	8.30E-01
TY232M-9	5.05E-01	3.25E-01	8.30E-01
TY232MX	4.98E-01	1.55E-01	6.53E-01
TY232MX-RW	5.24E-01	1.04E-01	6.29E-01
TY23M	2.16E-01	8.65E-01	1.08E+00
TY23M-0	2.16E-01	8.65E-01	1.08E+00
TY23M-2	2.16E-01	8.65E-01	1.08E+00
TY23MFR	2.18E-01	6.33E-02	2.82E-01
TY23MFR-RW	2.18E-01	6.33E-02	2.82E-01
TY23MX	2.14E-01	6.33E-02	2.78E-01
TY23MX-RW	2.14E-01	6.33E-02	2.78E-01
TY242M	8.22E-01	1.70E-01	9.92E-01
TY242M-0	8.18E-01	1.70E-01	9.88E-01
TY242M-1	8.18E-01	1.70E-01	9.88E-01
TY242M-5	8.18E-01	1.70E-01	9.88E-01
TY242M-7	8.18E-01	1.70E-01	9.88E-01
TY242MX	8.23E-01	2.76E-01	1.10E+00
TY242MX-RW	8.23E-01	2.76E-01	1.10E+00
TY244M	1.63E+00	3.26E-01	1.95E+00
TY244M-2	1.63E+00	3.26E-01	1.95E+00
TY244M-4	1.63E+00	3.26E-01	1.95E+00
TY244M-6	1.63E+00	3.26E-01	1.95E+00
TY244MX	1.61E+00	2.43E-01	1.86E+00
TY244MX-RW	1.61E+00	3.26E-01	1.94E+00
TY24M	5.47E-01	1.33E-01	6.80E-01
TY24M-0	5.47E-01	1.69E-01	7.16E-01
TY24M-1	5.47E-01	1.45E-01	6.93E-01
TY24M-2	5.47E-01	1.45E-01	6.93E-01
TY24MFR	5.51E-01	1.33E-01	6.84E-01
TY24MFR-RW	5.51E-01	1.33E-01	6.84E-01
TY24MX	5.32E-01	1.33E-01	6.66E-01
TY24MX-RW	5.47E-01	1.33E-01	6.80E-01
TY253M	1.91E+00	4.28E-01	2.34E+00
TY253M-0	1.93E+00	1.50E-01	2.08E+00
TY253M-1	1.93E+00	1.50E-01	2.08E+00
TY253M-3	1.93E+00	1.50E-01	2.08E+00
TY253M-5	1.93E+00	1.50E-01	2.08E+00
TY253MX	1.86E+00	4.28E-01	2.29E+00
TY253MX-RW	1.87E+00	2.93E-01	2.16E+00
TY25M	1.21E+00	2.35E-01	1.45E+00
TY25M-2	1.19E+00	1.53E-01	1.34E+00
TY25M-5	1.19E+00	1.53E-01	1.34E+00
TY25MFR	1.29E+00	1.53E-01	1.44E+00
TY25MFR-RW	1.29E+00	1.53E-01	1.44E+00
TY25MX	1.19E+00	2.20E-01	1.41E+00
TY25MX-RW	1.21E+00	1.53E-01	1.36E+00
TY26M	8.01E-01	1.47E-01	9.48E-01
TY26M-0	1.17E+00	2.22E-01	1.39E+00
TY26M-1	1.17E+00	2.22E-01	1.39E+00
TY26M-2	1.17E+00	2.22E-01	1.39E+00
TY26M-7	1.17E+00	2.22E-01	1.39E+00
TY26MX	1.17E+00	2.39E-01	1.41E+00
TY26MX-RW	1.15E+00	1.54E-01	1.31E+00
TY271MX	2.14E+00	4.44E-01	2.58E+00
TY272M	2.99E+00	3.74E-01	3.37E+00
TY272MX	2.91E+00	3.74E-01	3.28E+00

Variant	Weight of the cable tie (g)	Weight of the packaging (g)	Weight of the cable tie + weight of the packaging (g)
TY272MX-RW	2.91E+00	1.66E-01	3.08E+00
TY27M	4.39E+00	7.56E-01	5.15E+00
TY27M-0	4.33E+00	7.39E-01	5.07E+00
TY27M-2	4.33E+00	5.82E-01	4.91E+00
TY27M-3	4.33E+00	3.42E-01	4.67E+00
TY27M-8	4.33E+00	3.42E-01	4.67E+00
TY27MFR	4.39E+00	1.13E+00	5.52E+00
TY27MFR-RW	4.39E+00	1.20E+00	5.59E+00
TY27MX	4.18E+00	7.39E-01	4.92E+00
TY27MX-RW	4.18E+00	3.42E-01	4.52E+00
TY28M	2.72E+00	4.37E-01	3.16E+00
TY28M-0	2.57E+00	4.32E-01	3.00E+00
TY28M-2	2.57E+00	2.98E-01	2.87E+00
TY28M-8	2.57E+00	1.55E-01	2.72E+00
TY28MFR	2.65E+00	5.40E-01	3.19E+00
TY28MFR-RW	2.65E+00	6.71E-01	3.32E+00
TY28MX	2.63E+00	4.32E-01	3.06E+00
TY28MX-RW	2.65E+00	2.98E-01	2.95E+00
TY29M	9.32E+00	1.92E+00	1.12E+01
TY29M-2	9.18E+00	1.92E+00	1.11E+01
TY29M-3	9.18E+00	9.00E-01	1.01E+01
TY29M-6	9.18E+00	2.15E+00	1.13E+01
TY29MX	8.98E+00	1.92E+00	1.09E+01
TY29MX-RW	8.98E+00	9.00E-01	9.88E+00
TY5232MR	5.05E-01	2.74E-01	7.79E-01
TY5232MXR	5.24E-01	2.74E-01	7.98E-01
TY523MR	2.16E-01	1.84E-01	4.00E-01
TY523MXR	2.14E-01	1.87E-01	4.01E-01
TY523MXR-RW	2.14E-01	1.79E-01	3.93E-01
TY5242MR	8.18E-01	2.76E-01	1.09E+00
TY5242MXR	8.23E-01	2.76E-01	1.10E+00
TY5244M	1.63E+00	8.37E-01	2.46E+00
TY5244MR	1.63E+00	4.80E-01	2.11E+00
TY5244MX	1.61E+00	8.37E-01	2.45E+00
TY5244MXR	1.61E+00	4.80E-01	2.09E+00
TY524MR	5.47E-01	4.06E-01	9.53E-01
TY524MXR	5.47E-01	2.48E-01	7.95E-01
TY524MXR-RW	5.47E-01	2.48E-01	7.95E-01
TY5253MR	1.88E+00	4.72E-01	2.35E+00
TY5253MXR	1.87E+00	4.68E-01	2.33E+00
TY525MR	1.19E+00	4.72E-01	1.66E+00
TY525MXR	1.19E+00	3.73E-01	1.56E+00
TY526MR	1.17E+00	7.48E-01	1.92E+00
TY526MXR	1.15E+00	3.66E-01	1.52E+00
TY5271MXR	2.14E+00	6.88E-01	2.82E+00
TY5272MR	2.99E+00	7.32E-01	3.72E+00
TY5272MXR	2.91E+00	7.32E-01	3.64E+00
TY527MR	4.33E+00	1.05E+00	5.38E+00
TY527MXR	4.18E+00	9.25E-01	5.11E+00
TY528MR	2.57E+00	6.85E-01	3.25E+00
TY528MXR	2.63E+00	9.86E-01	3.62E+00
TY529M	9.18E+00	1.81E+00	1.10E+01
TY529MX	8.98E+00	2.34E+00	1.13E+01
TY53510M	1.28E+01	5.06E+00	1.79E+01
TY53510M-3	1.28E+01	5.06E+00	1.79E+01
TY53510M-4	1.28E+01	5.06E+00	1.79E+01
TY53510M-6	1.28E+01	5.06E+00	1.79E+01
TY53510MX	1.31E+01	3.76E+00	1.69E+01
TY54513M	1.62E+01	5.64E+00	2.19E+01
TY54513M-2	1.62E+01	5.64E+00	2.19E+01

Variant	Weight of the cable tie (g)	Weight of the packaging (g)	Weight of the cable tie + weight of the packaging (g)
TY54513MX	1.64E+01	5.64E+00	2.20E+01
TY54SM	7.21E-01	1.47E+00	2.19E+00
TYB232M	5.06E-01	1.48E-01	6.54E-01
TYB232MX	5.24E-01	2.42E-01	7.67E-01
TYB23M	2.20E-01	1.58E-01	3.78E-01
TYB23M-0	2.16E-01	1.11E-01	3.28E-01
TYB23M-2	2.16E-01	1.11E-01	3.28E-01
TYB23MX	2.14E-01	1.11E-01	3.26E-01
TYB24M	5.55E-01	2.24E-01	7.79E-01
TYB24M-0	5.47E-01	2.24E-01	7.71E-01
TYB24MX	5.32E-01	2.14E-01	7.46E-01
TYB25M	1.21E+00	3.88E-01	1.60E+00
TYB25M-0	1.19E+00	3.88E-01	1.58E+00
TYB25M-2	1.19E+00	3.88E-01	1.58E+00
TYB25M-6	1.19E+00	3.88E-01	1.58E+00
TYB25MX	1.19E+00	3.89E-01	1.58E+00

Extrapolation rules

The extrapolation rules have been calculated based on the environmental impact assessment results considering all the 23 products, and the sensitivity analysis carried out to individuate the influential parameters.

For the manufacturing stage, distribution stage and end-of-life stage, the influential parameters considered for the calculation of the LCIA impacts of the variants are the ties weight, packaging weight and ties composition (nylon and steel). For the end-of-life stage, the influential parameters considered for the calculation of the LCIA impacts of the variants are the ties weight and ties composition (nylon and steel). For the installation stage, the influential parameter considered for the calculation of the LCIA impacts of the variants is the packaging weight. The calculation of the LCIA impacts of the variants through these parameters indicated that the correlation between the impacts of the representative product and the variants is linear. For the creation of extrapolation rules, the extrapolation principle applied is a linear correlation between the impacts and weight of cable ties for the production and end-of-life stages, and between the impacts and weight of the cable tie + weight of the packaging for the distribution and installation stages.

Each environmental indicator value shall be calculated using the following formulas:

- For the manufacturing and end-of-life stages:

$$y = a_n x_1 + b_n$$

where x_1 is the weight of the cable tie (g);

- For distribution and installation stages:

$$y = a_n x_2 + b_n$$

where x_2 is the weight of the cable tie (g) + weight of the packaging referred to the functional unit (g).

For the weight of the cable tie + weight of the packaging of all the variants, please refer to the table above.

The calculation of the coefficients a&b for the Use Stage was not performed because the selected parameters do not affect the values for this stage.

The following table reports the linear coefficients an & bn for each life cycle stage

IMPACT CATEGORY	MANUFACTURING		DISTRIBUTION		INSTALLATION		USE		END OF LIFE	
	a_1	b_1	a_2	b_2	a_3	b_3	a_4	b_4	a_5	b_5
Climate change	1.16E-02	4.25E-03	2.41E-04	-7.98E-09	1.00E-03	-2.28E-04	-	-	1.54E-03	-2.06E-05
Climate change - Fossil	1.19E-02	3.91E-03	2.41E-04	-7.97E-09	6.89E-04	1.81E-05	-	-	1.54E-03	-2.06E-05
Climate change - Biogenic	-3.33E-04	3.33E-04	1.71E-07	-5.67E-12	3.11E-04	-2.46E-04	-	-	2.03E-07	1.54E-08
Climate change - Land use and LU change	4.99E-06	1.29E-06	1.19E-07	-3.93E-12	2.02E-08	-3.91E-09	-	-	3.86E-08	-2.93E-10
Ozone depletion	1.13E-10	2.61E-11	5.19E-12	-1.72E-16	3.71E-12	2.30E-13	-	-	8.64E-12	-1.09E-13
Acidification	5.04E-05	1.54E-05	1.39E-06	-4.61E-11	2.37E-07	-2.65E-08	-	-	4.58E-07	-4.37E-09
Eutrophication, freshwater	3.77E-06	1.73E-07	1.67E-08	-5.51E-13	5.50E-09	-8.58E-10	-	-	9.54E-09	6.00E-11
Eutrophication, marine	1.77E-05	5.92E-06	4.69E-07	-1.55E-11	1.46E-07	-2.32E-08	-	-	2.27E-07	-2.41E-09
Eutrophication, terrestrial	9.82E-05	3.01E-05	5.05E-06	-1.67E-10	1.06E-06	-9.65E-08	-	-	2.07E-06	-2.09E-08
Photochemical ozone formation	3.26E-05	9.71E-06	1.76E-06	-5.84E-11	3.05E-07	-4.17E-08	-	-	5.71E-07	-5.09E-09
Resource use, minerals and metals	1.16E-08	4.97E-09	6.27E-10	-2.08E-14	1.16E-10	-2.76E-11	-	-	2.10E-10	-1.63E-12
Resource use, fossils	2.18E-01	5.94E-02	3.51E-03	-1.16E-07	3.10E-04	-9.97E-05	-	-	5.58E-04	-1.33E-06
Water use (from AWARE)	9.79E-03	3.87E-03	1.63E-05	-5.38E-10	1.03E-05	-4.46E-08	-	-	2.23E-05	-4.55E-07
PERE	1.29E-02	-2.41E-03	4.99E-05	-1.65E-09	1.85E-05	-3.22E-06	-	-	3.09E-05	-3.13E-07
PERM	4.52E-03	-1.35E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-	-	0.00E+00	0.00E+00
PERT	1.74E-02	-3.76E-03	4.99E-05	-1.65E-09	1.85E-05	-3.22E-06	-	-	3.09E-05	-3.13E-07
PENRE	1.77E-01	4.71E-02	3.51E-03	-1.16E-07	3.10E-04	-9.97E-05	-	-	5.58E-04	-1.33E-06
PENRM	4.07E-02	1.23E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-	-	0.00E+00	0.00E+00
PENRT	2.18E-01	5.94E-02	3.51E-03	-1.16E-07	3.10E-04	-9.97E-05	-	-	5.58E-04	-1.33E-06
Use of secondary material	3.00E-04	1.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-	-	0.00E+00	0.00E+00
Use of renewable secondary fuels	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-	-	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-	-	0.00E+00	0.00E+00
Net use of fresh water	2.53E-04	9.56E-05	5.36E-07	-1.77E-11	4.42E-07	-1.15E-08	-	-	8.84E-07	-1.55E-08
Hazardous waste disposed	2.25E-07	5.91E-08	2.15E-08	-7.13E-13	1.70E-09	-5.04E-10	-	-	3.33E-09	-7.81E-12
Non-hazardous waste disposed	1.14E-03	3.13E-04	2.92E-04	-9.65E-09	6.79E-05	-2.60E-05	-	-	2.78E-05	-6.33E-08
Radioactive waste disposed	5.84E-07	1.64E-08	1.03E-09	-3.42E-14	3.87E-10	-6.84E-11	-	-	6.20E-10	-6.52E-12
Components for re-use	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-	-	0.00E+00	0.00E+00
Materials for recycling	4.26E-04	4.70E-04	0.00E+00	0.00E+00	1.10E-04	-5.43E-05	-	-	0.00E+00	0.00E+00
Materials for energy recovery	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-	-	0.00E+00	0.00E+00
Exported energy	2.95E-05	-3.57E-10	0.00E+00	0.00E+00	3.80E-03	1.27E-05	-	-	7.80E-03	-1.07E-04
Particulate matter	4.51E-10	1.54E-10	2.38E-11	-7.86E-16	2.44E-12	-6.62E-13	-	-	4.15E-12	1.20E-15
Ionising radiation	2.45E-03	6.73E-05	4.28E-06	-1.42E-10	1.52E-06	-2.77E-07	-	-	2.41E-06	-2.49E-08
Ecotoxicity, freshwater	2.34E-02	5.83E-03	1.69E-03	-5.59E-08	1.70E-03	9.26E-05	-	-	3.87E-03	-4.68E-05
Human toxicity, cancer	3.24E-12	1.58E-12	1.05E-13	-3.47E-18	1.42E-13	-2.52E-15	-	-	2.86E-13	-3.34E-15
Human toxicity, non-cancer	4.11E-11	7.55E-12	2.44E-12	-8.07E-17	1.24E-12	-5.80E-14	-	-	2.51E-12	-3.02E-14
Land use	6.67E-02	-2.17E-02	3.39E-03	-1.12E-07	1.60E-04	-7.13E-05	-	-	2.43E-04	2.23E-06

Comparability

EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows PEP comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.

Applicable product standards

List of applicable product standards and certifications for Ty-rap products: Lloyd's Register of Shipping, DNV-GL, Mil Specification, American Bureau of Shipping (ABS), CE declaration, compliant to the low voltage directive, EN/IEC 62275, UL 62275, CSA 62275, MS3367/3368 and EN45545.

References

- PEP ecopassport® PROGRAM, PCR-ed4-EN-2021 09 06, Product Category Rules for Electrical, Electronic and HVAC-R Products.
- PEP ecopassport® PROGRAMME, PSR-0003-ed2-EN-2023 06 06, Specific rules for Cable Management Solutions.
- ISO 14040: Life cycle assessment. Environmental management. Principles and Framework. International Organization for Standardization, 2006.
- ISO 14044: Life cycle assessment. Environmental management. Requirements and guidelines. International Organization for Standardization, 2006.
- PRé Consultants, Software SimaPro 9.5, 2023 (www.simapro.com).
- Ecoinvent, 2022. Swiss Centre for Life Cycle Assessment, v 3.9.1 (Home - ecoinvent).
- UNI EN 15804:2012+A2:2019: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- EN 50693:2019: Product category rules for life cycle assessments of electronic and electrical products and systems

Environmental Impact Indicator Glossary

Impact indicators

Indicator	Description	Distri-bution
Global warming potential (GWP) - total	Indicator of potential global warming caused by emissions to air contributing to the greenhouse effect. The total global warming potential (GWP-total) is the sum of three sub-categories of climate change. GWP-total = GWP-fossil + GWP-biogenic + GWP- land use and land use change	kg CO_2 eq.
Ozone depletion (ODP)	Emissions to air that contribute to the destruction of the stratospheric ozone layer	kg CFC-11 eq.
Acidification of soil and water (A)	Acidification of soils and water caused by the release of certain gases to the atmosphere, such as nitrogen oxides and sulphur oxides	H+ eq.
Eutrophication (E)	Indicator of the contribution to eutrophication of water by the enrichment of the aquatic ecosystem with nutritional elements, e.g. industrial or domestic effluents, agriculture, etc. This indicator is divided to three: freshwater, marine and terrestrial.	kg P eq., kg N eq., mole N eq.
Photochemical ozone creation (POCP)	Indicator of emissions of gases that affect the creation of photochemical ozone in the lower atmosphere (smog) because of the rays of the sun.	kg NMVOC eq.
Depletion of abiotic resources – elements (ADPe)	Indicator of the depletion of natural non-fossil resources	kg Sb eq.
Depletion of abiotic resources – fossil fuels (ADPf)	The use of non-renewable fossil resources in an unsustainable way (e.g. from material to waste)	MJ (lower heating value)
Water Deprivation potential (WDP)	Deprivation-weighted water consumption. Assesses the potential of water deprivation, to either humans or ecosystems, building on the assumption that the less water remaining available per area, the more likely another user will be deprived.	m^3 eq. depr.

Resource use indicators

Indicator	Description	Distri-bution
Total use of primary energy	Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) + Total use of renewable primary energy re-sources (primary energy and primary energy resources used as raw materials)	MJ (lower heating value)

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Date of issue: ***06-2024***	Validity period: **5 years**

Independent verification of the declaration and data, in compliance with ISO 14025: 2006

Internal: ○ **External:** ◉

The PCR review was conducted by a panel of experts chaired by Julie ORGELET (DDemain)

PEP are compliant with XP C08-100-1 :2016 or EN 50693:2019
The components of the present PEP cannot be compared with components from any other program.

Document in compliance with ISO 14025: 2006 "Environmental labels and declarations. Type III environmental declarations"